

Old and new discovery of bacterium with strong immunity activating power and its application

Hay bacillus is widely used for various fields in our daily life, from traditional Natto (fermented soy beans) to recent bio pesticide, and being recognized its beneficial functions. It is classified to the genus of Gram-positive *Bacillus* that forms *endospore* "Spore", which tolerates the high temperature and dryness. ⁽¹⁾

In the genus *Bacillus*, the phyla *subtilis* is categorized as harmless to the human body and differentiated from the phyla *tulingensis* ⁽²⁾, which is used for bio pesticide.

We investigated bacterial strain "*Bacillus subtilis* DB9011," which is patented by AHC Ltd., Maebashi-city, Gunma, about the influence on the human body as the spore is used for food. The DB9011 has been used for livestock food additives ⁽³⁾ for more than ten years and its safety test has already completed. Later on, a research found that it has the same character, among the phyla *subtilis*, with the phyla *Bacillus natto*. Natto is a traditional processed food that had already been used from Jomon era (circa 10,500 B.C to 300 B.C.) in Japan, and *Bacillus natto* and *Bacillus subtilis* are the same kind since they are harmless to the human and forming spore. In fact, the most inoculums of Natto bacteria being used for Natto are classified to the phyla *Bacillus subtilis*.

There would be almost no doubt that Natto is nutritious health food. Generally the amount of bacteria in Natto is only about 100,000 per gram, and spore is just a part of them. And with normal taking of Natto, it would have just about 10 million bacteria in it. Dietary supplement that uses DB9011 can give you more than 150 million bacteria in the form of spore as a daily amount. This is equivalent to take more than 1.5 kg of Natto per day. The dietary supplement does not contain substances like Nattokinase, which should not be taken a lot at a time, since it is beforehand refined to pure spores by washing away all unnecessary elements.

The figure 1 shows the influence on the human body based on the data collected in Japan and Philippines by cooperation of patients' and medical agencies.

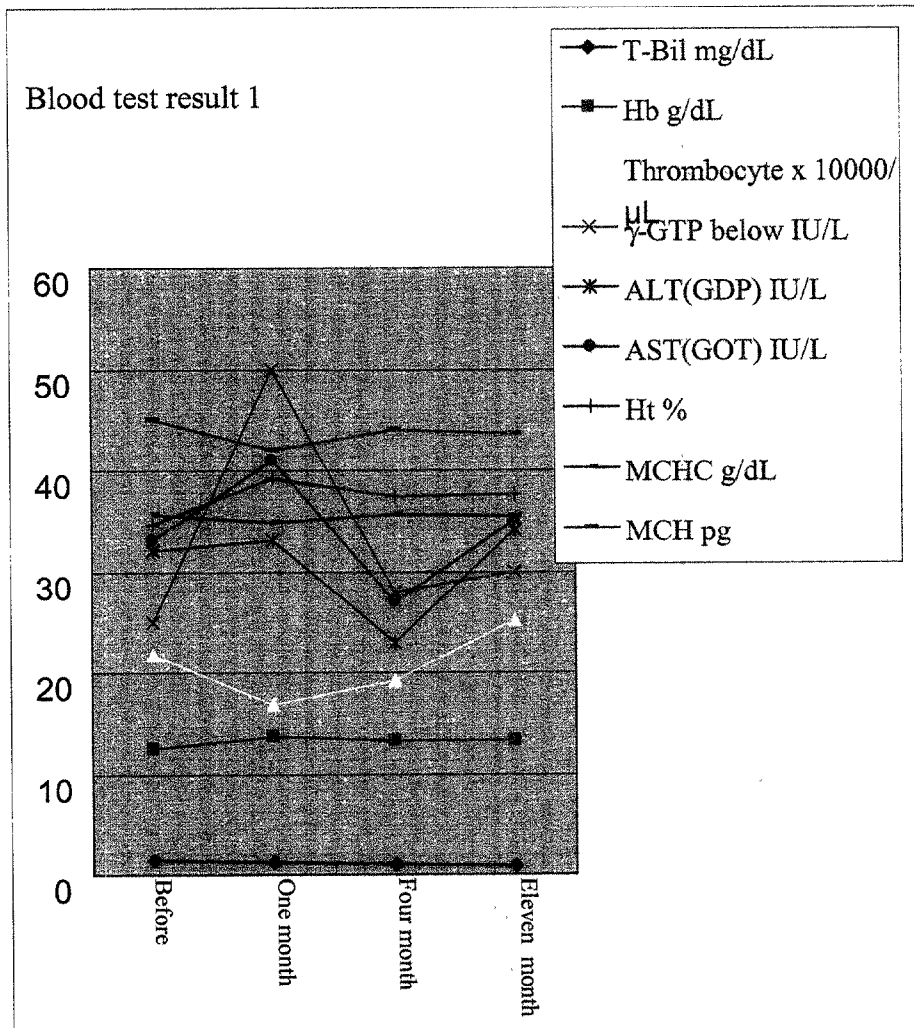
Fig 1. Epidemiological research (Human) of the effect

No	Disease	N	Effective	Ratio	Note
1	Stomatitis	80	68	85.00%	
2	Improve recovery after surgical operation	60	56	93.33%	
3	Toothache	50	41	82.00%	
4	Gum disease such as Gingivitis	35	35	100.00%	
5	Improve anticancer drug side effect	30	25	83.33%	
6	Tonsillitis	30	21	70.00%	
7	Bacterial Colitis	26	24	92.31%	
8	Joint inflammation or Rheumatism	25	22	88.00%	
9	High blood pressure and its symptoms	20	15	75.00%	
10	Recover immune system weakened by HIV & Influenza affection	13	12	92.31%	
11	Stomach ulcer caused by Gastritis and Helicobacter pylori	10	8	80.00%	
12	Insulin-independent diabetes mellitus	7	7	100.00%	
13	Hangover	6	6	100.00%	
14	Endometriosis	6	5	83.33%	
15	Bronchitis	5	3	60.00%	
16	Pneumonia	5	2	40.00%	
17	Pollenosis	4	4	100.00%	
18	Joint inflammation	3	3	100.00%	
19	Infection caused by Trichophyton	3	3	100.00%	2: eyelid, 1: toe
20	Improve bad breath	3	3	100.00%	
21	Bacterial dermatitides	3	2	66.67%	
22	Insulin-dependent diabetes mellitus	2	2	100.00%	Except for juvenile
23	Hepatitis B	2	2	100.00%	
24	Hyperlipemia	1	1	100.00%	
25	Irregular pulse (Gum disease as considered cause)	1	1	100.00%	
26	Eczema	1	1	100.00%	
27	Parkinson's disease	2	2	100.00%	
28	Atopic dermatitis	1	1	100.00%	
29	Vicious tumor	2	2	100.00%	w/ high concentration
30	Lymphatic gland inflammation by unknown cause	1	1	100.00%	
31	Improve chronic diarrhea and feces	3	3	100.00%	
Total		435	376	86.41%	

As the figure 1 indicates, with the dosage with meal, more than 80 % of improvement can be seen among the wide range of diseases. This is considered not only by rejuvenation of T cell, which has already been reported in the past animal test with the use of DB9011, but also any adjustment functions working on cytokine such as interleukin and so on. Moreover, it is assumed that stronger influence on Th1 rather than Th2 since influence on NK cell observed by dogs and others is not always accompanying. (5) Because effective ratio on the *periodontitis* and *endometriosis* is high in which IL-2 is related, Th1 differentiation is prompted rather than Th2 differentiation, and as a result of enough $\beta 2$ chain production among IL-12 receptors, which is peculiar to Th1, there would be possible signal transmissions occurring other than humoral immunity promotion.

Although there is only one case so far, figure 2 and 3 show a case of a *B hepatitis* patient, male, sixty nine year-old, had been in bed. He now enjoys healthy life and fishing with his grandchildren.

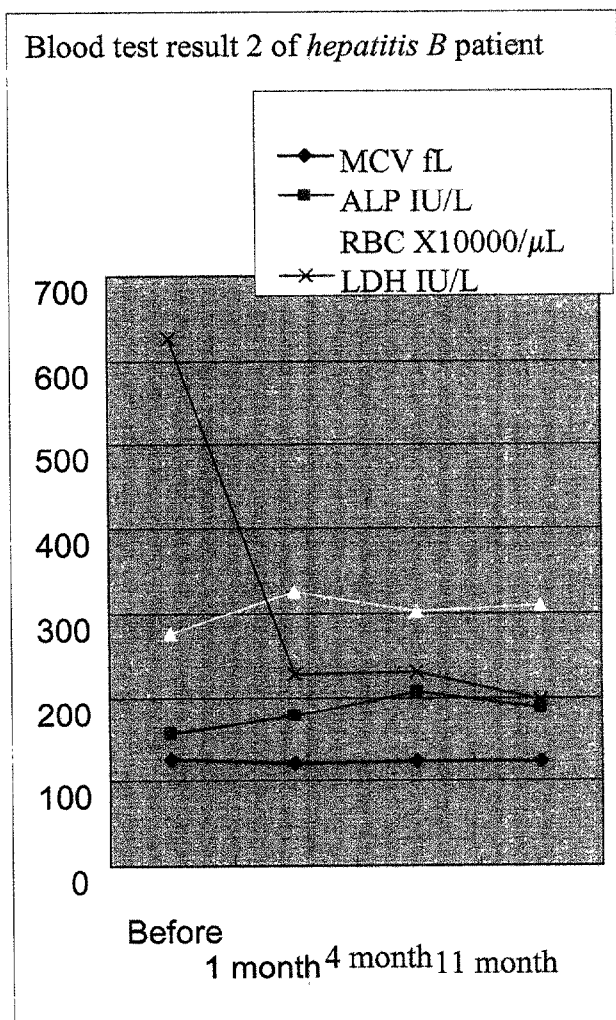
Fig 2



There is no changes on the amount of White blood cell and it stays around 6,000 / μ L before and after.

As shown, T-Bil kept going down from 1.3 mg / dL to 0.8 mg / dL, which is normal level, in eleven months.

Fig 3



Right after dosage, LDH started decreasing and stayed in the normal range.

Another case is pollen allergen. The patient is forty six year-old male and in the season he suffers snivel, sneeze, and itchy eyes and uses oral medicine, nasal spray, and herb tea for relief. After four to five hours of DB9011 dose, those symptoms were just gone and according to him, unlike medicine and tea that he normally uses, there is no discomfort feeling such like dry nostril.

What makes *the spore* working so well? Current assumption is based on DB9011's life history trait and spore's function. First, there is a difference between exospore and endospore. Exospore is basically the "spore" itself and the mean of multiplication, on the other hand, endospore is called "bacterial spore" and is the status of dormant under the environment where trophozoite is not enough for multiplication. In other word, the image of "the spore" differs from the seeds, rather it is close to sclerotia that is observed among fungi, transformation fungi, and mushrooms. Generally known example of dormant state is ergot that ergot fungus creates. Extracts that is derived from ergot are Ergotamine (also Cafergot and Creamine as medicines,) as used for serotonergic vasoconstrictor. Therefore, there would be no wonder that bacterium in dormant state contain several kinds of substance that are worked as signal transmitter.

Second, since the spore is in dormant state of *Bacillus subtilis* and its heat resistance, drought resistance, and chemical resistance, it is considered that biological availability via digestive tract is low, and in fact it is reported that digestibility of DB9011 spore is less than twenty percent. However, with the consideration of some facts that spore germinates under the environment where the spore can be transformed to trophozoite, and it takes about twelve hours to form spore and more than ninety percent of gene is used for spore forming compared to only twenty to thirty percent of gene usage for trophozoite, it is expected that the spore contains various signal transmitting substances for DB9011 to transform from germination totrophozoit forming.^{(1) (6)} Thus, as shown in figure 1 such as drastic effectiveness on Parkinson's disease, it indicates a possibility of existence of direct functioning mechanism besides cytokine adjustment function that is relevant to inflammation diseases. We are planning to keep researching useful bioactivity in dormant organism broadly and elucidate the functioning mechanism of DB9011.

Lastly, *Bacillus subtilis* DB9011 is not only kind of these endospores but there are others that are deeply and widely rooted our daily life for a long time. For instance, when we eat the mushroom and horsetail, we also eat the spore (exospore) included in the fruit body at the same time. Others like ergot, wheat spica-like endospore (sclerotium,) mentioned above, contains toxic substances. Even there are various kinds and forms of spores such as zoospore and asexual spore that rely on its completeness and life history trait, yet they have not been fully understood and spotlighted so much except for the spore like ergot that has harmful aspect. In the view of usefulness, this research has spotlighted to the field and clearly stated the existence of promising path to the spore utilization for complementary and alternative medicine and integrated medicine, which has never been able to obtain or been hard to obtain. Furthermore, the spore of Reishi mushroom has been recently separated and been sold domestically as dietary supplements. From now on, the research of this field would take various fields and materials and will be considered importantly.

Citation:

- (1) "Bacillus subtilis and Other Gram-Positive Bacteria", A. L. Sonenshein, J. A. Hoch and R. Losick, American Society of Microbiology, 1994
- (2) "Bacillus subtilis and Its Closest Relatives", A. L. Sonenshein, J. A. Hoch and R. Losick, ASM Press, 2002